REMARKS

This paper is responsive to the Office Action mailed from the Patent and Trademark Office on November 30, 2004, which has a shortened statutory period set to expire February 28, 2005. A petition for a one-month extension is submitted herewith, thereby extending the period of response to March 28, 2005.

Specification

The specification is amended to correct inadvertent incorporation by reference of several non-patent references. Applicants contend that the material represented in these references is exemplary of Applicants' best mode, and as such is not essential material. Further Applicants believe that in each instance cited by the Examiner the referenced subject matter is well known to those skilled in the art, specifically:

1) Page 22, "Steerable Filters": steerable filters and pyramids are commonplace in the image processing and computer vision fields. For many people of Applicants' skill level it would be unnecessary to consult the references given. For students this material would be covered in most gradate courses on computer vision.

2) Page 22, "Stability of Phase Information": the citation to the use of phase information does not deal with an issue critical to the details of the invention, except to support that this particular implementation is one of the best modes (i.e., produces accurate estimates of image motion). However other methods exist that would likely produce estimates of similar quality.

3) Page 23, Region-Based Tracking": any graduate student in the field of computer vision should be

comfortable with parameterized warp functions and optimization for parameter estimation. Again this reference would be unnecessary for many people skilled in the art, and is there mainly for the uninitiated.

4) Page 24, "Mixture Models": the EM algorithm is critical to the implementation in this invention. That said, this is commonplace in computer science courses at the graduate level in computer vision, machine learning, text analysis, data mining, parameter estimation, stochastic processes, etc. This is a common mathematical tool, known to people skilled in the art. It is taught and/or used in at least 10 graduate courses in computer science at the University of Toronto. Most introductory books on statistical pattern recognition and machine learning, as well as modern textbooks on computer vision explain the EM algorithm.

5) Page 28 "Stability of Phase Information": the method to detect instabilities is useful, and specific to this particular instantiation (or mode) of the invention. The method for detecting phase instabilities is extremely straightforward in the cited paper, and many other people have implemented it and used it.

6) Page 28, "Mixture Models": the use of coarse-to-fine optimization is common in motion estimation. Coarse-to-fine techniques are taught in almost any graduate course on computer vision, and date back to the 1980s. They are commonplace.

7) Page 29: "Phase-Based Disparity Measurement": the relationship between the phase gradient and the filter response gradient is based on a well-known trigonometric identity taught in high school. The use of the identity for computing phase gradients is straightforward and

mechanical, and therefore often relegated to an appendix in papers. It is straightforward to anyone skilled in the art.

For the above reasons, Applicants contend that the specification as amended herein is complete.

Claims

Claims 1-20 are pending in the above-identified application. Claim 20 is rejected under 35 USC 112, and Claims 1-20 are rejected under 35 USC 102 as being unpatentable over cited references that are identified below.

In the current paper, Claims 1-19 remain as filed, and Claim 20 is amended in response to the rejection under 35 USC 112. No new matter is entered. Reconsideration and withdrawal of the pending rejection is respectfully requested.

Rejections Under 35 USC 112

In paragraph 2 of the Office Action, Claim 20 is rejected under 35 USC 112 for having insufficient antecedent basis for "third mixing probability".

In response to this rejection, Claim 19 is amended to recite "a third mixing probability", thereby providing proper antecedent basis for the recitation of "third mixing probability" in Claim 20. No new matter is entered.

For at least the above reasons, Applicants respectfully request reconsideration and withdrawal of the rejections under 35 USC 112.

Rejections Under 35 USC 102

Claims 1-20 are rejected under 35 U.S.C. 102 as being anticipated by Fleet et al. "A framework for Modeling Appearance Change in Image Sequences" (herein "Fleet").

Claim 1 is amended herein to recite (in pertinent part):

> A method for generating an appearance model utilizing image data provided in a plurality of sequential image frames, the appearance model defined by a stable component including a first mixing probability and a first data parameter defined by image data provided in a relatively large number of said sequential image frames, the relatively large number being greater than three, the appearance model also including a transient component having a second mixing probability and second data parameter defined by image data provided in a relatively small number of said sequential image frames...

As set forth in paragraph 0012 of Applicant's specification, the stable component allows the method of the present invention to adapt to slowly developing appearance changes:

> **[0012]** The stable component models relatively stable image data (i.e., image data that varies little over a relatively large number of image frames preceding a most recently received frame). By incorporating the stable component, the appearance model of the present invention is able to adapt to slowly developing appearance changes while maintaining a natural measure of the stability of the observed image structure. That is, the stable component facilitates highly reliable identification of an image structure by weighting stable image structure

properties more heavily for motion estimation than unstable properties, which are proportionally downweighted.

As amended, Claim 1 is distinguished over Fleet in that the framework for modeling appearance changes taught by Fleet fails to teach or suggest a "stable component including a first mixing probability and a first data parameter defined by image data provided in a relatively large number of said sequential image frames, the relatively large number being greater than three", as recited in Claim 1.

Claims 2-7 are dependent from Claim 1, and are distinguished over Fleet for at least the reasons provided above with respect to Claim 1.

Similar to Claim 1, Claim 8 is amended herein to recite (in part) "estimating a motion of the target object using an adaptive appearance model including a first image component having parameters defined by image data received over a relatively large number of image frames temporally preceding the current image frame, the relatively large number being greater than three..." As such, Claim 8 is believed to be distinguished over Fleet for at least the reasons cited above with reference to Claim 1.

Claims 9-13 are dependent from Claim 8, and are distinguished over the cited prior art for at least the reasons provided above with respect to Claim 8.

Similar to Claims 1 and 8, Claim 14 is amended herein to recite (in part) "An adaptive appearance model...comprising...a first image component having parameters defined by image data that remains stable over a relatively large number of said sequential image frames, the relatively large number being greater than three..."

As such, Claim 14 is believed to be distinguished over Fleet for at least the reasons cited above with reference to Claim 1.

Claims 15-18 are dependent from Claim 14, and are distinguished over the cited prior art for at least the reasons provided above with respect to Claim 14.

Similar to Claims 1, 8 and 14, Claim 19 is amended herein to recite (in part) "An adaptive appearance model...comprising...a first image component including a first mixing probability having a value that is determined by image data appearing over a relatively large number of said sequential image frames, the relatively large number being greater than three" As such, Claim 19 is believed to be distinguished over Fleet for at least the reasons cited above with reference to Claim 1.

Claim 20 is dependent from Claim 19, and is distinguished over the cited prior art for at least the reasons provided above with respect to Claim 19.

For at least the above reasons, Applicants respectfully request reconsideration and withdrawal of the rejections under 35 USC 103.

CONCLUSION

Claims 1-20 are pending in the present Application. Reconsideration and allowance of these claims is respectfully requested. If there are any questions, please telephone the undersigned at (408) 451-5902 to expedite prosecution of this case.

Respectfully submitted,

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I hereby certify that this correspondence is being deposited with the United States Postal Service as FIRST CLASS MAIL in an envelope addressed to: Mail Stop Amendment, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on March 28, 2005.

3/28/2005
Date

Signature: Rebecca A. Baumann